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ABSTRACT

A program for prospective elementary and secondary teachers emphasizing inquiry and problem solving techniques for use in the classroom is described. In the conceptual framework of this program, a situation is defined as a set of circumstances that teachers commonly encounter, and an issue is a theoretical, ethical, or methodological question. A problem is a set of circumstances in a classroom situation that disturbs a teacher. Two common problems are instructional and managerial. Others include circumstances related to a school's curriculum or its patterns for organizing students or staff. In this program instructors provide typical classroom problems and professional issues. Students practice inquiry processes and skills as they respond to given situations and attempt to correctly identify basic problems and find solutions. Participants also examine standard topics of teacher preparation, such as individual differences among learners and methods for planning, conducting, and evaluating instruction. In keeping with the program's inquiry emphasis, each of these topics is regarded as a common source of professional problems for teachers or as a tool for solving such problems. (JD)

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Teacher Education With an Inquiry Emphasis

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During the last ten years, the concept of competency based teacher education (CBTE) has become the most influential innovation in the curriculum of teacher preparation. Although CBTE programs vary a great deal, they generally emphasize the mastery of preconceived instructional competencies by credential candidates. The rapid growth of CBTE is largely a response to dissatisfaction from inside and outside the teaching profession toward conventional teacher preparation programs. Underlying the CBTE movement is the basic assumption that all prospective teachers should learn particular strategies and tactics for planning, conducting and evaluating instruction. By formulating clear definitions of specific teaching competencies, many CBTE advocates have contributed a significant measure of precision and purpose to the curriculum of teacher preparation. Largely because of CBTE, the content of teacher education is likely to remain less amorphous and aimless than it was prior to the 1970s.

CBTE programs have also had their share of pitfalls and shortcomings, however. Some CBTE advocates appear to regard credential candidates as passive recepticles, into which minimal competencies must be poured. The concept of the prospective teacher as an active learner in a career of lifelong learning seems to be forgotten in some CBTE centers. Another misconception is to regard teachers solely as technicians who habitually perform the competencies they have mastered, regardless of environmental variables and their own idiosyncracies. When this tendency toward mindless technology goes unchecked, CBTE programs begin to resemble "teacher training" more that "teacher education."

As an alternative to the CBTE concept, a teacher education program with an inquiry emphasis is being developed in the Teacher Education Laboratory at UCLA. Five faculty members and approximately 150 preservice credential candidiates have participated in this program during the first five years of its existence. Although the inquiry program is not intended solely as an alternative to CBTE, its underlying assumptions and conceptual structure are very different from those of CBTE. Furthermore, the inquiry program is not the only experimental program of UCLA's Teacher Education Laboratory (TEL), but it is the only TEL program to be described in this paper. The program's conceptual framework, philosophical assumptions, curriculum design and instructional methods are outlined first, followed by a report of some empirical findings related to the program. A glance at anticipated developments in the inquiry program concludes the paper.

Conceptual Framework. A set of key concepts and principles have gradually emerged during the years in which the inquiry program has been developed. In this conceptual structure, a *situation* is a set of circumstances that teachers commonly encounter, and an *issue* is a theoretical, ethical or methodological question or dilemma that confronts many teachers. A *problem* is either a set of circumstances in a situation, or an aspect of an issue, that puzzles or disturbs a teacher. Two common kinds of problems are *instructional problems*, which are perceived gaps between existing and desired student capabilities, and *managerial problems*, which are circumstances related to classroom procedures or routines that make instructional problems difficult to resolve. Other kinds of *problems* include circumstances related to a school's curriculum, or its patterns for organizing students or staff.

A *solution* is defined as a set of circumstances that effectively replace or alleviate the disturbing or puzzling facets of a problematic situation. To affect a solution usually requires a series of actions that are cumulatively designed to replace or alleviate the puzzling or disturbing circumstances; such a sequence of steps is a *strategy*. On the other hand, a *solution* may also be a concept or principle that effectively resolves the disturbing or puzzling aspects of a problematic issue. In either case, formulating a strategy or resolving an issue is called *problem-solving* or *decision-making*. *Inquiry*, however, is a more complex process of reflective thinking in which teachers discern, analyze and resolve perceived problems or issues. *Teaching* is regarded as a profession in which problem-solving and decision-making are prevalent activities. Finally, the term *teaching staff* is used to denote a complex, multifaceted pattern of behaviors that characterizes an individual teacher's professional activities, and that develops through *inquiry*.

Philosophical Assumptions. The design and implementation of the inquiry program have been based on six underlying assumptions, which are spelled out below.

(1) Teachers encounter an enormous variety of situations and issues in which many kinds of significant problems are embedded.

(2) Since teachers must execute the solutions to most educational problems, the most effective solutions are the ones they formulate, and that reflect their own philosophies and personalities, as well as environmental conditions.

(3) To teach all prospective teachers to use a given set of instructional behaviors is an ineffective way to prepare them to solve the problems they will encounter, because of variability in their philosophies and personalities, and in the situations and issues that will confront them.

(4) Teachers can effectively and routinely resolve the problematic situations and issues they encounter only if they begin to utilize personal teaching styles that reflect their own philosophies and personalities, as well as environmental conditions.

(5) Teachers formulate major elements of their personel teaching styles when they use inquiry processes to resolve significant problematic situations or issues.

(6) By learning to use basic inquiry skills, prospective teachers will begin the gradual process of formulating their own teaching styles, which must continue for several years in order for mature styles to emerge.

The curriculum and methodology of the experimental program have been designed to reflect these assumptions, only some of which have been investigated empirically.

Curriculum Design. The objectives and structure of the program's curriculum are based on an abstract model of inquiry whose eight phases are outlined next.

(1) A teacher recognizes and defines a problematic situation or issue.

(2) The teacher thoroughly examines the problem and its context, causes and consequences.

(3) The teacher conceives a set of circumstances that represent a potentially viable, comprehensive solution for the problem.

(4) The teacher postulates at least two feasible, comprehensive plans or strategies for accomplishing the goal conceived in (3) above.

(5) The teacher critically examines the assumptions underlying each strategy, and compares the probably consequences of each strategy with the goal conceived in (3) above.

(6) The teacher selects a preferred strategy, which may eclectically combine the most promising elements of several alternative plans.

(7) The teacher tries out the preferred strategy systematically and comprehensively.

(8) Finally, the teacher reassesses the entire situation or issue, trying to discern new problems embedded therein.

These eight aspects of reflective thinking are among the topics for direct instruction in the inquiry program. Instructors explain and illustrate specific skills and techniques for each major phase of this inquiry model. For example, to learn how to implement the crucial fifth phase above, students practice four particular inquiry skills.

(5a) Identify the assumptions (e.g. about teaching and learning) that underlie each strategy.

(5b) Decide whether each strategy addresses major features, rather than merely peripheral features, of the problem.

(5c) Decide whether each strategy (or each element of each strategy) is feasible.

(5d) Envision the probable consequences of each strategy, including positive, negative, intended and unintended outcomes.

After students examine each element of the inquiry model, instructors provide practice at inquiry processes and skills by posing typical classroom problems and professional issues. On some of these occasions, faculty members describe common classroom situations orally or in writing, or they play videotapes of typical classroom events. On other occasions they present professional issues or ethical issues related to teaching or schooling. Working individually, in small groups, or as an entire class, students practice inquiry processes and skills as they respond to the given situations and issues.

During the course of the inquiry program, participants also examine many of the standard topics of teacher preparation, such as the aims and functions of schooling, individual differences among learners, and methods for planning, conducting and evaluating instruction. In keeping with the program's inquiry emphasis, each of these topics of regarded as a common source of professional problems for teachers, or as a tool for solving such problems. For example, issues of educational equality and case studies of learning disabilities are presented as problem *sources* during two courses in the foundations of education. Methods of philosophical analysis, simulation and values clarification are utilized during the same courses as *tools* for solving some of the professional and moral dilemmas of teaching. Meanwhile, during courses in curriculum and instruction, aspects of curricular planning, classroom management and student-teacher relationships are

treated as *sources* of professional problems. Techniques for preassessment, instructional planning and individualization are presented as *tools* for resolving problematic situations that teachers encounter. In these ways, the inquiry model forms the core of the experimental program's curriculum design.

Instructional Methods. The inquiry emphasis permeates the methods of instruction as well as the overall design of the program's curriculum. Instructors often conduct discussions of typical classroom situations in which particular kinds of problems or issues are embedded. On other occasions, groups of students discuss the situations they have encountered in their field activities. During both kinds of discussions, students often encounter a need for a particular concept, principle, method or other inquiry tool. Whenever possible, instructors take these opportunities to explain or illustrate relevant concepts, principles or methods, and ask students to relate them to the problem at hand.

Instructors use "guided discovery" strategies on some occasions, such as the initial lesson in which the objective is to formulate a definition of *inquiry*. On other occasions, however, students become active inquirers who pose questions or problems, and plan, conduct and report the results of investigations of these problems. Many of their investigations occur in elementary and secondary schools, but other occur in nearby communities, school district offices, and in the UCLA Library. The reports of their investigations assume many forms, including panel presentations, written essays or journals, three dimensional projects or multimedia products.

Other instructional activities in the inquiry program are designed to provide concepts, principles or competencies that students may use as tools for problem solving inquiry. These added activities include field trips, guest speakers, films, teaching demonstrations, microteaching, role playing activities, lectures and assigned readings. The major requirements that all students must complete also contribute to the program's inquiry emphasis. Students apply their inquiry skills as they write essays about four of the situations in Problem Situations in Teaching by Gordon Greenwood, Thomas Good and Betty Siegel (1971). They also practice their inquiry skills as they write journals about their field experiences, and as they identify and resolve problems related to their own professional development. In these ways, all learning activities in the program contribute to its inquiry focus.

Empirical Findings. To determine the immediate effects of the experimental program on the inquiry skills of participating students, an evaluation study was conducted during the Fall Quarter of 1977. Two situations were selected from the sixteen Problem Situations in Teaching (Greenwood and others, 1971). On the first day of the program, each student (N=30) was randomly assigned to one of these situations, and asked to describe, in an essay, how he/she would respond to the situation. The instructors retained these essays without reading them. In December, during a final examination, each student wrote another essay to explain how he/she would respond to the second of the two problem situations. The two sets of essays were then combined by a staff member, who crossed out all dates and all references to "pretest" or "final examination." Two faculty members from the inquiry program then read and scored all sixty student essays according to the following criteria:

(1) general resourcefulness;
(2) general insightfulness;
(3) logical development of ideas;
(4) application of relevant concepts and principles;
(5) quality of the identification and analysis of the problem;
(6) clarity of statements of assumptions or goals;
(7) quality of alternative strategies for resolving the problem; and
(8) plan for testing a preferred strategy.

Each reader awarded a maximum of five points to each essay for each criterion, yielding a maximum overall score of forty points for each essay. The two readers made their assessments independently of each other, but rated the pretest and posttest essays in randomly mixed sets.

The evaluation criteria were hypothesized to reflect two sets of independent concerns. The first four criteria were conceived as general criteria that are often used to evaluate essays written by college students. The last four criteria related directly to the specific goals of the inquiry program. To examine the factor loadings of the eight criteria, the entire set of criterion scores (N=960) were subjected to a factor analysis. Table 1 shows the resulting factor matrix. With one exception, the hypothesized factor loadings of the evaluation criteria were confirmed. Criteria Four and Five were not loaded most heavily on the same factors as Criteria 1-3 and 6-8, respectively, as had been anticipated. Instead, they tapped the same factors as Criteria 6-8 and 1-3, respectively. The factor matrix showed the eight criteria to be loaded most heavily on two factors, as hypothesized; Criteria 1-3 and 5 tapped a common factor most heavily, and Criteria 4 and 6-8 tapped a distinct factor.

The coefficient of correlation between the two raters' overall scores was used as a measure of the interrater reliability of these scores. These coefficients were .75 and .84 for the first and second problem situations (N=30), which indicated that the two raters used the evaluation criteria with relatively high reliability between themselves.

Means and standard deviations of scores by the two raters for pretest and posttest essays appear in Table 2, which shows that mean scores increased from 12.15 among pretests to 26.95 on posttests. However, a closer look suggests that interaction effects may account for much of the variance in posttest scores. For example, Problem 1 drew higher scores than Problem 2 as a pretest problem, but the opposite pattern characterized the posttest scores. Similarly, Rater 2 awarded higher scores than Rater 1 to pretest essays, but posttest essays again yielded the opposite pattern. The degree to which variance in posttest scores can be attributed to mean effects and interaction effects is shown in Table 3.

According to the analysis of variance in Table 3, none of the variance in pretest or posttest scores can be attributed to differences between the two problems, or to an interaction between the two raters and the two problems. Overall differences between the two raters were more pronounced, but may have been due to the relatively small sample size. Three other factors were too potent to be attributed to sampling error, however. If all the test scores had been drawn from the same population, then the probability of the observed interaction between the two problems and the two test dates would be only.074. Similarly, the probability of the observed interaction between the two raters and the test dates would be only .008, and the observed difference between mean pretest and mean posttest scores would have a probability of less than .001. Individual scores, then, were likely to be influenced by the sequence in which the two problems were assigned to a student, by the fact that the two raters were not equally

discriminating between pretest and posttest essays, and by the three-way interaction between dates, raters and problems. By far, however, an essay's score depended most heavily on whether it was written as a pretest or a posttest, which suggests that the experimental program effectively improved the inquiry skills of thirty prospective teachers.

These essay test results, however, do not indicate whether or not the participating students will actually use inquiry processes to solve professional problems and formulate personal teaching styles. Since the students who participated in the program during the Fall 1977 began supervised teaching only recently, it has not yet been feasible to determine the extent to which they utilize inquiry skills in the field. Their intentions to use inquiry processes in teaching were investigated simultaneously with the pretest and posttest inquiry essays (September and December, 1977). These findings, however, were disappointing. In a questionnaire that was distributed to all students in the Teacher Credential Program at UCLA, two items were designed to reveal the students' orientations to inquiry. The two items are reproduced below.

84. Making decisions. As a teacher, you will naturally make many important, long-range decisions about curriculum, instruction, relationships with students, etc. How will you generally go about making these significant decisions?

1	2	3	4	5	6	7
I will generally adopt the idea that occurs to me spontaneously, and that seems intuitively right. This is likely to be the most effective decision for me, since it will reflect my own personality.						I will generally try to examine all the information I can obtain and analyze each situation from several points of view. My most effective decisions will emerge from systematic analysis of several alternative solutions to each problem.

85. Your Overall Teaching Style. Over the years, there will be many occasions to reflect on your overall style of teaching. How will you handle these occasions?

1	2	3	4	5	6	7
I will take every opportunity to critically reexamine my teaching procedures and the assumptions on which they are based. When these analyses show my procedures and assumptions to be defective, I will try to revamp my entire style of teaching.						I will try to think of ways to improve my teaching procedures, including ones that have already proved to be successful for me. To reformulate such procedures entirely would be a poor use of my professional time.

Table 4 shows the numbers of students in the inquiry program, and not in the inquiry program, who responded to the above items. Means and standard deviations of their responses in September and December also appear in Table 4. Mean responses to both items in September suggest that students who entered the inquiry program were initially more oriented toward reflectivity and critical thinking than other students, which is not surprising since all the students selected the programs they entered. An analysis of the variance in these September responses showed, however, that the initial group differences were not significant. Nevertheless, variability in December responses was examined through an analysis of covariance, with the September responses as the covariate, to partial out the effects of initial differences on the December responses. This analysis showed that students in the inquiry program were not significantly more likely than students in other teacher preparation program to use inquiry processes as teachers. In fact, Table 4 suggests that both groups of students changed in complex but similar ways during the Fall Quarter. Average responses to Item 1 indicate that during the quarter both groups of students became more inclined to reflect on their decisions, and less inclined to adopt quick solutions. However, mean responses to Item 2 suggest that both groups also became less willing to reformulate their assumptions and teaching procedures on reflective occasions. Perhaps these items were not valid measures of the students' orientations to inquiry; a follow-up study of all credential students is being planned, in order to determine the extent to which both groups of students eventually use inquiry skills as teachers.

Future Prospects. Several programatic developments and research efforts are planned for the coming months. A typology for classifying professional problems and issues will be developed and the validity of the inquiry model for solving all types of problems and issues will be examined. Concurrently, instructors will attempt to expand the program's conception of *inquiry*, which has been viewed synonymously with *problem-solving* in the past. New strategies are being developed to enable students to direct the course of individual and group inquiries into teaching and schooling. Aptitude-treatment interaction studies will examine relationships between the program's inquiry emphasis and individual differences in achievement motivation, anxiety levels, cognitive styles and conceptual tempos. The long term effects of the program will be investigated in follow-up studies of its graduates. Finally, its indirect effects on elementary and secondary school students will also be examined in longitudinal studies. It is hoped that, eventually, UCLA's program of teacher preparation with an inquiry emphasis will contribute to our knowledge of human inquiry and its applicability to teacher education.

Table 1

Varimax Rotated Factor Matrix:
Eight Criteria Used by Two Raters to
Evaluate Pretest and Posttest Inquiry Essays

		Factor 1	Factor 2
Criterion 1:	General Resourcefulness	.83	.29
Criterion 2:	General Insightfulness	.99	-.02
Criterion 3:	Logical Development of Ideas	.71	.52
Criterion 4:	Application of Concepts/Principles	.28	.72
Criterion 5:	Problem Identification/Analysis	.70	.41
Criterion 6:	Statements of Assumptions/Goals	.21	.68
Criterion 7:	Alternative Strategies	.30	.57
Criterion 8:	Preferred Solution	.02	.76

Table 2

Means and Standard Deviations of
Scores by Two Raters for
Pretest and Posttest Inquiry Essays

	Problem 1		Problem 2		Overall	
	Mean	SD	Mean	SD	Mean	SD
Pretest						
Rater 1	12.07	6.25	9.13	3.66	10.60	4.96
Rater 2	14.00	4.68	13.40	5.08	13.70	4.88
Combined	13.03	5.46	11.27	4.37	12.15	4.92
Posttest						
Rater 1	25.87	5.59	28.80	4.46	27.33	5.03
Rater 2	26.33	5.29	26.80	7.92	26.57	6.60
Combined	26.10	5.44	27.80	6.19	26.95	5.82
Combined	19.57	5.45	19.53	5.28	19.55	5.37

Table 3

Analysis of Variance in
Scores by Two Raters for
Pretest and Posttest Inquiry Essays

Sources of Variance	df	Sum of Squares	Mean Squares	F	p
1. Pretest vs. Posttest	1	6571.11	6571.11	251.30	0.000
Error Term	28	732.16	26.15	1.95	0.173
2. Rater 1 vs. Rater 2	1	40.83	40.83	1.95	0.173
Error Term	28	585.63	20.92		
3. Problem 1 vs. Problem 2	1	0.03	0.03	0.00	0.981
Error Term	28	1689.15	60.33		
4. Interaction Effects					
Time x Rater	1	112.13	112.13	8.24	0.008
Time x Problem	1	90.13	90.13	3.45	0.074
Rater x Problem	1	0.03	0.03	0.00	0.969
Time x Rater x Problem	1	43.20	43.20	3.17	0.086
Error Term	28	381.17	13.61		

Table 4

Means and Standard Deviations of
Responses by Students in
Inquiry Program and Other Programs to
Pre and Postquestionnaire Items Regarding
Intentions to Use Inquiry Processes in Teaching

	September						December					
	Inquiry			Others			Inquiry			Others		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD
Item 1	29	5.4	1.1	151	5.1	1.5	27	5.6	1.2	130	5.4	1.2
Item 2	29	3.7	1.8	151	3.9	1.8	27	3.9	1.7	130	4.2	1.5